First Look at sPHENIX TPC dE/dx from GEANT4

sPHENIX TPC Meeting
/19/15
Jeffery T. Mitchell

A First dE/dx Study

This is a first look at the dE/dx distribution coming out of GEANT4.

I am running Alan's macro Fun4All_G4_tpc_plus_vtx_single.C located in CVS at sphenix/simulation/g4simulation/macros/TPC.
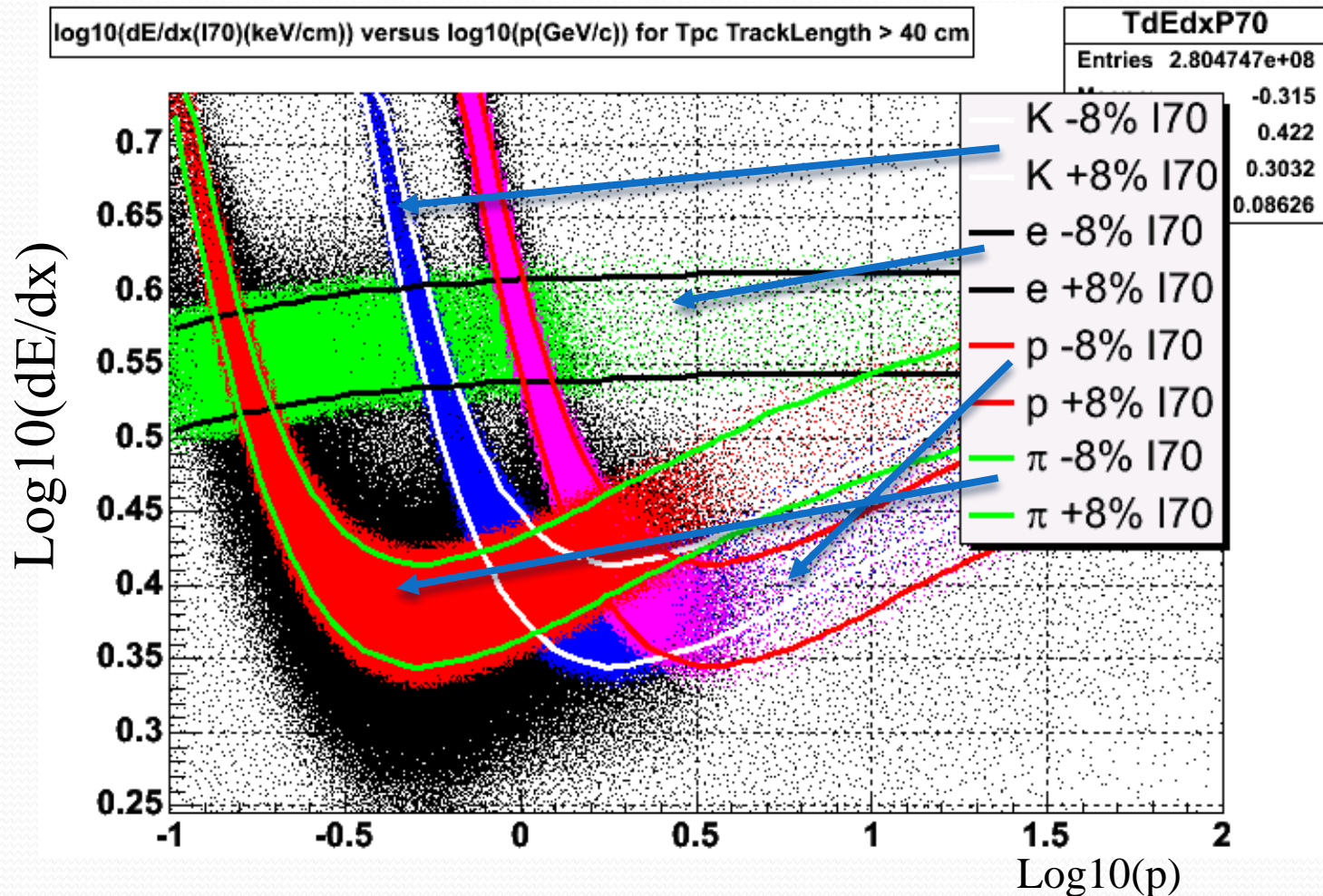
I accumulated 2.5 million GEANT4 hits for each of the following: pions, kaons, protons, and electrons. [3 runs of 200 events with 50 particles in each event]

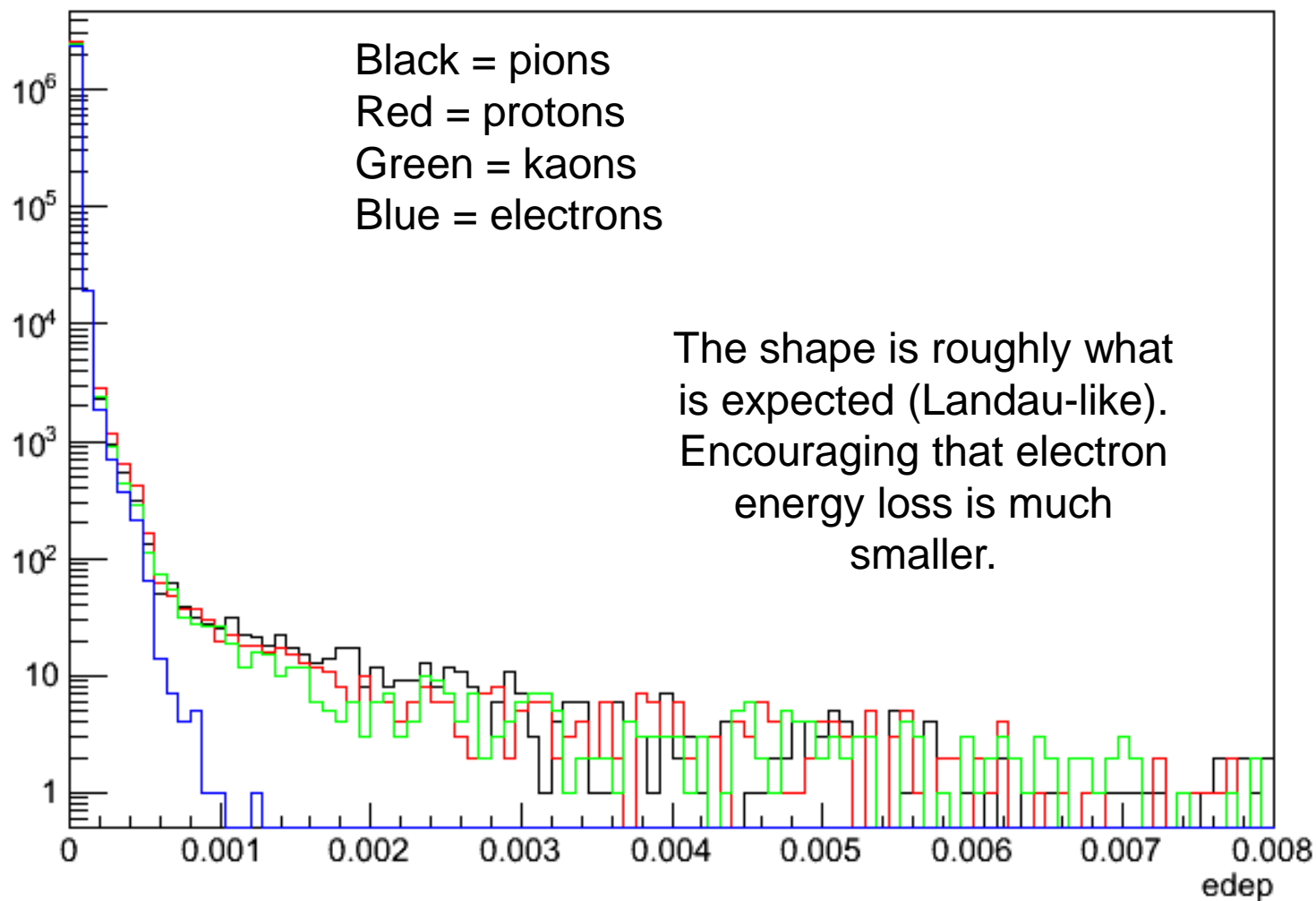From the macros, I believe that the gas is Argon.

The goal is to try and reproduce the STAR TPC pid plot on the next page.

Using the edep output in the ntp_g4hit ntuple.
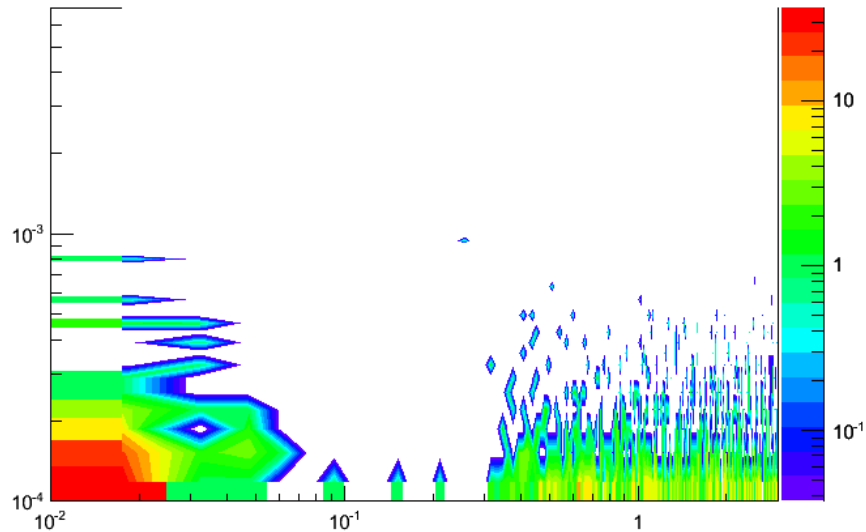
Particle ID with dE/dx (STAR)
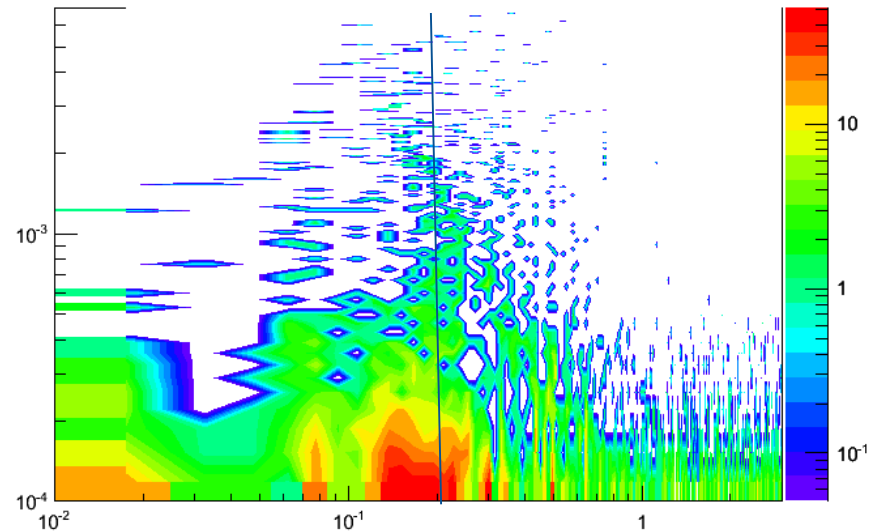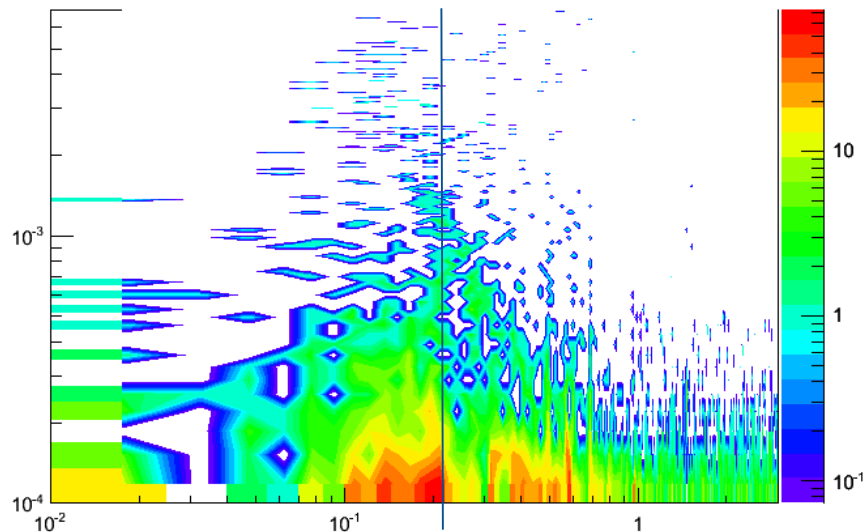
Energy deposit vs. Particle Type

Black = pions
Red = protons
Green = kaons
Blue = electrons

The shape is roughly what is expected (Landau-like). Encouraging that electron energy loss is much smaller.

Energy deposit vs. momentum
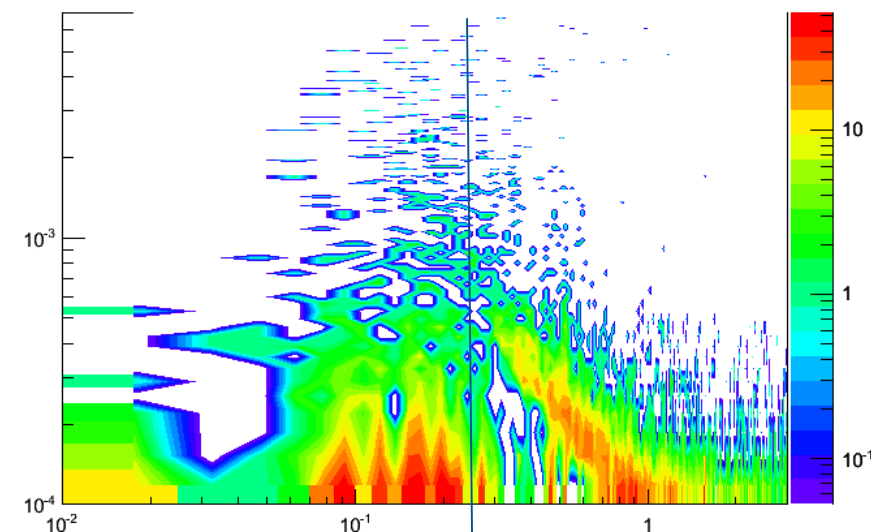
Summary

This was a good exercise to get me more familiar with sPHENIX simulations.

The GEANT4 raw edep distribution looks Landau-like and behaves as expected for the particle types tested.

The expected particle ordering may be present, although it is difficult to tell with the current statistics.

Ready for a more in-depth studies with more statistics. It looks like it is easy to change the pre-defined gas type at the macro level.